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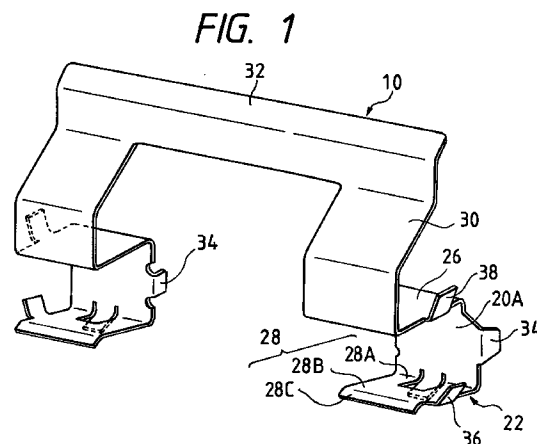
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(54) **Pad clip for disc brake**

(57) A pad clip (10) for use in a disc brake in which a concave and convex fitting structure is formed in a braking support portion between each of friction pads (12) disposed opposite to a rotor (14), and a support member (16) for bearing braking force from the friction pads (12). The pad clip (10) is installed between projections (18) of the friction pads (12) and anchor concave grooved portions (24) of a support member (16) in the concave and convex fitting portions to thereby support the friction pads (12) respectively. In the pad clip (10), plate spring portions (28) for urging the friction pads (12) in the radially outward direction of the rotor (14) are formed. Laterally extending guide projecting portions (36,38) are formed at side edges of the plate spring portions (28), and the lower edge portions of the projections (18) are engaged with the guide projecting portions (36) respectively so that the plate spring portions (28) can be pushed and spread.



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a pad clip for use in a disc brake for braking a vehicle, and particularly relates to an improvement of a pad clip for holding a friction pad which moves in the axial direction of a rotor so as to reduce the sliding resistance of the pad against a support member.

2. Description of the Prior Art

In a conventional disc brake, a pair of friction pads disposed so as to be able to press and hold a rotor therebetween are provided on a support member, so that when the friction pads sandwiches the rotor by the action of a caliper and a hydraulic cylinder device and are made to rotate together with the rotor, side edge portions of the pads are anchored by means of the support member so as to obtain satisfactory braking force. In order to make the friction pads move so as to contact with the rotor surface while being held by the support member, a pad clip is installed in the anchor portion between the pads and the support member so as to reduce the sliding friction. This pad clip is fitted to the anchor surface of the support member facing the side edge portions of the friction pads, so that the pad clip is formed in advance so as to trace the shape of the anchor of the support member. The pad clip is extended to the inner circumferences of each friction pad, and the end of the extension is coupled with a spring portion engaged with an inner-circumferential corner portion on the rotor rotating-in side of the friction pads. For example, in Japanese Utility Model Publication No. Sho. 57-149337, as shown in Figs. 7(a) and 7(b), a U-shaped clip 3 is disposed between the opposite end portions of the friction pad 1 and a support member 2 and the clip 3 reaches the inner circumferential surface of a friction pad 1 through the side edge surface from the outer circumferential surface to cover the pad edge portions. At the end of the extension of this clip 3 toward the inner circumferential portion of the pad 1, a T-shaped plate portion extended in the direction of the thickness of the pad 1 from the clip body is provided in advance, and this plate portion is bent so as to be formed as a spring portion 4. The spring portion 4 is extended to the lower surface of the pad 1 so as to urge the pad to move in the radially outward direction of the rotor so that the inner circumferential surface of the pad 1 is separated from the support member surface opposite to the inner circumferential surface of the pad. Consequently, if a rotation moment may be generated in the friction pads to generate a couple to rotate the friction pads centering the holding portion thereof when the friction pads press and hold the rotor so as to be rotated and moved together with the rotor, the generation of such a couple

is suppressed by the above-mentioned urging given thereto in the opposite direction by the action of the spring portion. Therefore, the friction pads are adjusted lest the friction pads are inclined so that the end portions of the inner circumferential surfaces of the friction pads receive reaction force from the pad clip spring portion on the rotating-out side of the rotor to thereby spoil the smooth movement of the friction pads to the anchor portion of the support member, or lest the partial engaging of the pads with the rotor surfaces should arise.

The spring portion is formed by bending the T-shaped portion formed on the body of the pad clip. Then, in order to obtain an enough effect to raise the friction pad, a cut-raised portion is provided in a support member mounting portion of the clip body which is a base end of the spring portion so as to make the clip body separate a little from the support member to thereby reduce the spring constant of the spring portion. Specifically, as shown in Fig. 4, a U-shaped notch is formed in the body of the clip 3 extended on the inner circumferential surface of the pad 1, and a cut-raised portion 5 is formed in such a manner that it makes the clip body separate from the support member surface and so as to contact with the support member surface directly. In this manner, it is possible to reduce the gap between the inner circumferential surface of the pad 1 and the facing surface portion of the pad clip. Thus, it is possible to reduce the spring constant of the spring portion 4.

However, in the conventional pad clip for a disc brake, a pad clip is formed longitudinally in the radial direction of the rotor so as to be opposite to the whole side surfaces of friction pads, and a spring portion is formed in the top end portion of the pad clip to engage with the inner circumferential surfaces of the pads to thereby urge the pads by the spring force to cancel a braking couple of the pads. Therefore, it is necessary that the pad clip is extended to the inner circumferential of the pads over the anchor surface between the pads and a support member, and a T-shaped portion is formed and bent on the extension so as to come into contact with the inner circumferential portions of the pads to thereby form a spring portion. Accordingly, difficulty of the blanking property to form the spring portion arises a problem. In addition, because of necessity of ensuring enough length from a concave and convex fitting portion to the inner circumferential portions of the pads, it is necessary to use much material therefor, resulting in a disadvantage on the cost of the manufacture. Further, since a cut-raised portion is formed on the clip body in order to reduce the spring constant of the spring portion, force exerted to the spring portion acts on the cut-raised portion so that the force is entirely received by the cut-raised portion, and therefore a problem arises in strength.

As another example, Japanese Utility Model Publication No. Sho. 61-14662 discloses a friction pad and a pad clip as follow. A projection is formed at the side end surface of the friction pad, and a concave grooved por-

tion is formed in the support member which is opposite and fitted to the projection. That is, a concave and convex fitting portion is formed in order to slide and move the friction pad for the rotor surface by the projection and the concave grooved portion. A portion of the pad clip which is disposed between opposite end side portions of each friction pad and a support member is bent into a U-shape and extends from the outer circumferential surface of the pad to the side end surface of the pad so as to cover the end circumference of the pad, and following this, a portion is extended to reach the inner circumferential surface of the pad. Further, a spring portion is provided at the end of the extension of this clip extended to the inner circumferential portion of the pad so that the spring portion is in contact with the inner circumferential surface of the pad so as to urge the pad in the radially outward direction of the rotor. This pad clip has similar effect as disclosed in Japanese Utility Model Publication No. Sho. 57-149337.

However, the aforementioned structure is such that when friction pads are installed after such a clip is fitted to a support member, the above-mentioned spring portions interfere with the pads so that the pads cannot be installed if the clip is in a free shape in order to make the spring portions effectively show their action to raise the friction pads. Therefore, when the pads are installed, it is usually necessary to carry out such an assembling work in which, generally, the spring portions are pushed to spread once to thereby form a space where the pads are installed.

However, in such a conventional pad clip for a disc brake, it has been necessary to carry out such a work in which the projections of the pads are fitted into the support member anchor concave grooved portion while the clip spring portions are pushed and spread when the brake pads are installed, and particularly, there has been a problem that when the spring portions are pushed and spread, there arises sliding in the projecting portions so that the projecting portions cannot be fitted smoothly, and therefore the installation workability is low.

SUMMARY OF THE INVENTION

The present invention has been attained to solve the foregoing problems, and it is a first object thereof to provide a pad clip for a disc-brake in which the blanking property is improved, and which is able to save the material. It is a second object of the present invention to provide a pad clip in which there is no scattering in load and the strength can be therefore improved. Further, it is a third object of the present invention to provide a pad clip for a brake pad of which the installation workability for the friction pad is improved.

In order to achieve the above objects, according to a first aspect of the present invention, the pad clip for use in a disc brake having friction pads disposed opposite to a rotor, and a support member for bearing braking force from the friction pads, the pad clip being

inserted between side edge portions of the pads and an anchor portion of the support member so as to support the friction pads, is characterized in that a braking support portion between the support member anchor portion and each of the friction pads is designed to have a concave and convex fitting structure which is U-shaped in the side view, and that the pad clip is provided with plate spring portions and cut-raised portions, each of the plate spring portions being formed on one of opposite portions of the pad clip in the radial direction of the rotor so as to follow the U-shaped portion of the concave and convex fitting portion to thereby urge corresponding one of the friction pads in the radially outward direction of the rotor, the cut-raised portions being formed by cutting and raised at base end portions of the plate spring portions on the pad clip in the direction opposite to the spring force of the plate spring portions respectively so as to be brought into contact with the support member, each of the cut-raised portions being made to contact with a corner of the concave and convex portion.

According to a second aspect of the invention, the plate spring portion and the cut-raised portion is formed so that the spring fulcrum of the plate spring portion and the fulcrum of the cut portion being made common to each other in the pad clip according to the first aspect of the invention.

According to a third aspect of the invention, the pad clip for use in a disc brake having a concave and convex fitting structure in a braking support portion between friction pads disposed in opposite to a rotor, and a support member for supporting braking force from the friction pads, the pad clip being inserted between anchor projecting portions of the pads and anchor concave grooved portions of the support member constituting the concave and convex fitting structure to thereby support the friction pads, is characterized in that in the pad clip, plate spring portions for urging the friction pads in the radially outward direction of the rotor are formed in one of opposite portions in the radial direction of the rotor, which are the portions following the U-shaped portions in the concave and convex fitting portions, and guide projecting portions spread in the side direction are formed in the side edges of the plate spring portions, so that the plate spring portions can be pushed and spread while the edge portions of the anchor projecting portions of the pads are being engaged with the guide projecting portions.

According to the first aspect of the invention, the U-shaped portions of the pad clip are disposed to the anchor portions of the support member which are opposite to the respective friction pads, and the plate spring portions for supporting a couple of the friction pads on the rotating-out side of the rotor are formed by the clip body itself in one of the upper and lower opposite portions of the two U-shaped portions without extending the U-shaped portions to the inner circumferential side of the pads like in the conventional case.

Therefore, the projecting portion (or the concave grooved portion) provided in each of the friction pads is engaged with the corresponding U-shaped portion of the pad clip fitted to the concave grooved portion (or the projecting portion) provided in the corresponding anchor portion of the support member, so that each friction pad can be disposed on the support member by the engagement at one place on each of the rotating-in and rotating-out sides of the rotor. In addition, it is not necessary to form a T-shaped spring portion on the clip body, so that the blanking property at the time of formation of the clip is improved. Accordingly, it is possible to reduce the cost of manufacture.

In addition, by the plate spring portion of the pad clip, the lower surface of the projecting portion (or the upper surface of the concave grooved portion) is elastically supported on the lower surface of the concave grooved portion (or the upper surface of the projecting portion) which forms a couple support surface, so that there is no substantial clearance between these two surfaces. Particularly, the cut-raised portion bent in the opposite direction to the spring portion is formed so as to contact with a corner of the U-shaped portion of the support member, so that spring reaction force can be received by the whole surface of the cut-raised portion. Accordingly, it is possible not only to reduce the spring constant but also to stabilize the spring load.

According to the second aspect of the invention, the spring portion and the cut-raised portion has a common fulcrum point, so that there is no fear that the spring force is received only by the cut portion. Accordingly, the strength of the cut portion is improved.

According to the third aspect of the invention, when the brake pads are installed onto the support members, the pads are inserted into a pad clip in such a manner that the lower portions of the projections are engaged with the guide projecting portions while the pads are inclined. Then, clip spring portions are pushed down as they are by the projections of the pads so that the projections engage with the guide projecting portions. Accordingly, it is possible to ensure insertion spaces without detaching the projection from a concave grooved portion of the support member. Then, the upper portion of the pad is rotated so as to make the pad parallel to the rotor surface so that the upper edge portion of the projection can be inserted into the concave grooved portion of the support member. Accordingly, the pad can be installed simply.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a pad clip according to a first embodiment;
Figs. 2(a) and 2(b) are a side explanatory sectional view and a main portion sectional view illustrating the state where a pad clip according to the first embodiment is fitted;
Figs. 3(a) and 3(b) are a front view and a bottom view of the pad clip of the first embodiment;

Fig. 4 is a side view of the pad clip of a first embodiment;

Figs. 5(a) and 5(b) are explanatory diagrams of the operation of installation of a friction pad according to the first embodiment;

Fig. 6 is an explanatory sectional view of a second embodiment; and

Figs. 7(a) and 7(b) are explanatory diagrams of a conventional pad clip.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment of a disc-brake pad clip according to the present invention will be described below in detail with reference to Figs. 1 to 5.

Fig. 1 is a perspective view of a pad clip according to a first embodiment. Fig. 2(a) is a sectional view illustrating the state where a pad clip 10 according to the first embodiment is fitted to a disc brake, and Fig. 2(b) is a main portion enlarged sectional view of the clip. Figs. 3(a) and 3(b) are a front view and a bottom view of the pad clip 10.

As shown in Fig. 2(a), a concave and convex fitting portion is formed between each of friction pads 12 and a support member 16 for holding the pads and acting as a braking anchor in order to move and guide the friction pads 12 in the axial direction of a rotor 14 (in the direction perpendicular to Fig. 2(a)). In the present embodiment, a projection 18 is formed in a side edge portion of each friction pad 12, and a concave grooved portion 20 is formed in a braking anchor portion of the support member 16 which is opposite to the side edge portion of the pad so that the projection 18 and the concave grooved portion 20 are fitted to each other. A pad clip 10 according to the embodiment is disposed along the gap formed between such a concave and convex fitting portion. The pad clip 10 is formed from an inverted-U-shaped plate member which is bent so as to bridge the outer circumferential portion of the rotor 14 to thereby hold the friction pads 12 on both the inner and outer sides in the same manner.

The pad clip 10 has a U-shaped portion 22 which is U-shaped when viewed from the side and which is fitted into the concave grooved portion 20 of the support member 16 in each of the inner and outer side portions of the rotor 14. That is, the U-shaped portion 22 is constituted by an anchor portion 24 along an anchor surface 20A formed at the inner back portion of the concave and convex fitting portion, and upper and lower opposite portions 26 and 28 bent at the upper and lower ends of this anchor portion 24. The top end portion of the upper opposite portion 26 (on the outer circumferential side of the rotor) is further bent to form a coupling portion 30 extending outside from the gap formed at the opposite surface portions of the pad 12 and the support member 16. This coupling portions 30 on the inner and outer sides are coupled with each other through a bridge portion 32. The lower opposite portion 28 (rotor

inner circumferential side of the rotor) is formed as a plate spring portion for elastically supporting the friction pad 12. This plate spring portion 28 is bent continuously from the lower edge of the anchor portion 24 of the U-shaped portion 22. The plate spring portion 28 is constituted by an arc portion 28A which is formed while bent so as to contact with the lower area of the anchor surface in the concave grooved portion 20 of the support member 16 but not so as to contact with a lower surface portion 20D of the concave grooved portion 20, an extended portion 28B formed by extending this arc portion 28A in the obliquely upward direction, and an upper contact portion 28C formed in the top end of this extended portion 28B so as to contact with a lower surface 18D of the projection 18 in the friction pad 12.

Such a pad clip 10 is disposed on the support member 16 in such a manner that the U-shaped portion 22 is fitted into the concave grooved portion 20 of the support member 16 so that the upper opposite portion 26 of the U-shaped portion 22 contacts with an upper surface portion 20U of the concave grooved portion 20 while the anchor portion 24 contacts with the support member anchor surface 20A, and the plate spring portion 28 is disposed so as to be opposite to the lower surface portion 20D of the concave grooved portion 20. Support fitting pawls 34 are formed in the anchor portion 24 of the U-shaped portion 22 of the clip 10 in order to prevent the pad clip 10 from coming off from the support member 16.

Each of the friction pads 12 is constituted by a lining having an approximately fan-shaped external form and a back plate having almost the same form as the lining, and opposite side edge portions which are opposite to the anchor area end surface of the support member 16 in the rotation direction of the rotor 14, respectively. As mentioned above, the projecting portion 18 to be engaged with the concave grooved portion 20 of the support member 16 is formed in each of the opposite side edge portions of the friction pads 12. The projecting portions 18 on the opposite sides in the circumferential direction of the rotor are engaged with the U-shaped portions 22 of the pad clip 10, respectively, so that the friction pads 12 are disposed on the both inner and outer sides of the rotor 14, respectively. In the pad clip 10, as mentioned above, the plate spring portion 28 is constituted by the arc portion 28A bent and formed without contacting with the lower surface portion 20D of the concave grooved portion 20 in the support member 16, the extended portion 28B formed by extending this arc portion 28A in the oblique upper direction, and the upper contact portion 28C formed in the top end of this extended portion 28B and contacted with the lower surface 18D of the projection 18 in the friction pad 12. In addition, a cut-raised portion 40 is formed in the portion extending from the arc portion 28A, which is a base end portion of the plate spring portion 28, to the extended portion 28B. This portion 40 is cut and raised in the direction opposite to the direction where the urging force is given to the pad by the plate spring portion 28

so that the cut-raised portion 40 is made to contact with a corner portion 20C between the support member concave grooved lower surface portion 20D and the anchor portion 20A so as to stabilize the load given to the clip 10. The corner portion 20C is formed into arc to prevent concentration of stress, and the cut portion 40 is bent to trace this arc corner portion 20C so that the whole surface of the cut portion 40 is bent so as to contact with the corner portion 20C. That is, the cut portion 40 is cut and raised by cutting a U-shaped notch in such a manner that the notch starts from a start point which is coincident with the start point of the arc in the anchor surface 20A, turns back along a path from the arc portion 28A of the plate spring portion 28 to the extended portion 28B, and then reaches the start point of the arc. The cut portion 40 is cut and raised to the back side of the plate spring portion 28, and bent so as to trace the arc of the arc corner portion 20C, as shown in Fig. 2(b). The arc portion 28A of the plate spring portion 28 is made so as not to contact with the lower surface portion 20D of the concave grooved portion 20 as shown in the same drawing. The start point of the arc of the arc portion 28A is made to coincide with the notch start point of the cut portion 40 (the center line L in Fig. 3(a)) so as to make the spring fulcrum of the plate spring portion 28 and the fulcrum of the cut-raised portion 40 common to each other.

The operation of the pad clip 10 designed thus will be described below. Braking during the advance of a vehicle is performed by pressing a pair of friction pads 12 against the rotor 14 by means of an oil-pressure cylinder mechanism provided in a not-shown caliper. At this time, the two friction pads 12 rotate and move together with the rotor 14 while the pads are pressing and holding the rotor 14 therebetween. Then, a rotation moment is generated in the friction pads 12 so that a couple is generated to rotate the friction pads 12 centering their press-holding portion. The friction pads 12 are rotated by this couple so that the lower surface 18D of the projecting portion 18 of each of the friction pads 12 is pressed against the upper surface of the plate spring portion 28 of the U-shaped portion 22 of the pad clip 10 at the rotating-out side of the rotor 14.

In this case, the pushing-in force is elastically supported by the plate spring portions 28 provided in the lower opposite portions of the U-shaped portions 22, so that there is no substantial clearance between the two surfaces. Therefore, instability behaviors such as vibrations or the like of the friction pads 12 are suppressed at the time of braking of the vehicle, and the rotations of the friction pads 12 are suppressed. Although the plate spring portions 28 of the pad clip 10 support the couple from the friction pads 12, each of the cut-raised portions 40 is provided in the arc portion 28A which is a root of the plate spring portion 28, and the root of this cut portion 40 is made coincident with the root of the plate spring portion 28 so as to make the roots be a common spring support point. Accordingly, since the whole surface of the cut portion 40 is in contact with the concave

grooved corner portion 20C so that the whole of the cut portion 40 receives the elastic reaction force of the plate spring portion 28, the elastic urging force of the plate spring portion 28 becomes a stable elastic load. As a result, the support member force of the pads becomes so stable that the spring constant of the plate spring portions 28 can be reduced. In addition, because of a common structure where the plate spring portions 28 of the pad clip 10 and the cut-raised portions 40 are formed in the same portion, blanking in manufacturing the pad clip 10 is improved so that the manufacturing cost can be reduced.

At this time, the pad clip 10 is installed onto the support member 16 in advance so that the pads 12 are fitted to the pad clip 10 attached to the support member 16. The pad clip 10 is designed in such a manner as follows in order to make the pad installation work easy.

Guide projecting portions 36 spread outward are formed at the outside edges of the plate spring portions 28, and the edge portions of the projections 18 are engaged with the lower guide projecting portions 36 respectively so that the plate spring portions 28 can be pushed and spread, that is, the plate spring portions 28 can be pushed down to form spaces to which the projections 18 can be inserted. That is, the right edge portions of the plate spring portions 28 in Fig. 1 correspond to the back plates of the friction pads 12 respectively, where the lower guide projecting portions 36 are bent so as to be opposite to the backs of the projections 18 so that the pads cannot come off. Particularly, the lower guide projecting portions 36 are formed so as to incline so that the upper edge portions are spread outward, and the outside inclination angle β relative to the horizontal plane is established to be $\beta < 90^\circ$ as shown in Fig. 4.

At one of the side edges of an upper opposite portion 26 in each the U-shaped portion 22, that is, at the edge on the same side as the lower guide projecting portion 36, an upper guide projecting portion 38 is bent and formed upward. This upper guide projecting portion 38 is to hold the support member 16 when it is attached, and then the upper guide projecting portion 38 is not made parallel to the plane of the support member 16 but is inclined and bent. The direction of this bending is made the same as the direction of the lower guide projecting portion 36, and the angle α relative to the horizontal plane following the upper opposite portion 26 is formed so as to be $\alpha < 90^\circ$. The relationship between this angle α and the above-mentioned angle β is set so that the relation $\alpha < \beta$ is established.

Further, as shown in Fig. 4, the bent portion of the lower guide projecting portion 36 projects outward more than the bent portion of the upper guide projecting portion 38, and the distance L between these two portions is set to be smaller than the thickness of the back plate of the friction pad 12. Consequently, when the projection 18 is inserted from above while being guided by the upper and lower guide projecting portions 38 and 36,

the projection 18 is inserted obliquely while being restricted by these inclination angles α and β .

The operation of installation of friction pads by use of such a disc-brake pad clip having such a configuration will be described below.

As shown in Fig. 5(a), each pad 12 is inserted in a manner so that the outside edge portion of the lower end of the projection 18 is made agreed with the bent corner portion of the lower guide projecting portion 36 while the upper portion of the friction pad 12 is inclined to the left, that is, while the friction pad 12 is inclined correspondingly to the inclination of the lower guide projecting portion 36. As a result, the projection 18 contacts with the plate spring portion 28 of the pad clip 10, and is inserted so that the inside edge portion of the upper end portion of the pad projection 18 is located outside the upper guide projecting portion 38. At this state, the friction pad 12 is rotated with the outside edge portion of the lower end of the projection 18 as a fulcrum point clockwise in Fig. 5(a), the projection 18 pushes down the spring portion 28 in the condition that it contacts with the upper and lower guide projecting portions 38 and 36.

As a result of rotation, the projection 18 enters a portion under the upper guide projecting portion 38, as shown in Fig. 5(b). Finally, the projection 18 is held slidably on the pad clip 10 in a state that the friction pad 12 is kept vertical as shown in Fig. 5(c).

In such an embodiment, each friction pad 12 can be installed easily in such a manner that the pad clip 10 is installed on the support member 16 in advance, and the friction pad 12 is fitted onto the pad clip 10 so that the lower portion of the projection 18 of the friction pad 12 is inserted obliquely by use of the gap (L) between the upper guide projecting portion 38 and the lower guide projecting portion 36 in the U-shaped portion 22 of the clip 10, and the plate spring portion 28 is pushed down to thereby rotate the upper portion of the projection 18. The lower guide projecting portion 36 locks the projection 18 while the pad 12 is rotated, so that the projection 18 is prevented from coming off from the concave grooved portion 20. It is therefore possible to install the friction pad 12 on the support member 16 through a series of successive operations including inserting onto the clip 10 and upper portion rotating. Accordingly, it is possible to install the friction pads 12 extremely easily only by performing operations on pads without using any supplementary jigs.

Next, Fig. 6 shows a fitting structure of a pad clip 100 according to a second embodiment of the present invention. The second embodiment is different from the first embodiment in that the second embodiment is applied to a disc brake having a concave and convex fitting structure for each of the friction pads 12 in which a concave grooved portion 200 is formed in the side end surface of the friction pad 12, and a projection 180 is formed in the support member 16. A pad clip 100 has a U-shaped portion 220 to be fitted into a concave and convex fitting portion. A plate spring portion 260 formed

in the clip 100 is formed in an upper opposite portion of the U-shaped portion 220. That is, an arc portion 260A is formed at a corner portion where a coupling portion 300 extending upward from the plate spring portion contacts with the U-shaped portion 220, and this arc portion 260A is bent so as not to contact with an upper surface portion 180D of the projecting portion 180 of the support member 16. An extended portion 260B is formed by obliquely upward extending this arc portion 260A, and an upper contact portion 260C is formed by further bending the top end of this extended portion 260B so as to contact with an upper surface 200U of the concave grooved portion 200 of the friction pad 12. Further, a cut-raised portion 400 is provided along the portion from the arc portion 260A which is a base end portion of the plate spring portion 260, to the extended portion 260B. This cut portion 400 is cut and raised in the direction opposite to the direction of pad urging by the plate spring portion 260 so as to contact with a corner portion 180C between the upper surface portion 180D of the support member projection 180 and the support member end surface 300 to thereby stabilize the load given to the clip 100. Similarly to the first embodiment, the corner portion 180C is formed so as to be arcuate to prevent concentration of stress, and the cut portion 400 is bent to trace this arc corner portion 180C so that the whole surface of the cut portion 400 is bent so as to contact with the corner portion 180C. The arc portion 260A of the plate spring portion 260 is made so as not to contact with the upper surface portion 180D of the projection 180. The start point of the arc of the arc portion 260A is made to coincide with the notch start point of the cut portion 400 so as to make the spring fulcrum of the plate spring portion 260 and the fulcrum of the cut-raised portion 400 common to each other.

Also in the second embodiment, it is possible to stabilize the spring load to thereby reduce the spring constant, and it is possible to improve the blanking property to thereby reduce the cost of manufacture.

As has been described above, in the pad clip according to the present invention, a concave and convex fitting structure is formed in a braking support portion between a support member anchor portion and each friction pad so as to be U-shaped in the side view. In addition, in the pad clip, a plate spring portion for urging the friction pad in the radially outward direction of the rotor is provided in one of opposite portions in the radial direction of the rotor, which are the portions following the U-shaped portion, and a cut portion is cut and raised at the base end portion of this plate spring portion in the direction opposite to the urging direction of the plate spring so as to be in contact with the support member. The cut portion is made to contact with a corner of the concave and convex portion, and the spring fulcrum of the plate spring portion and the fulcrum of the cut-raised portion are made common to each other. Since the plate spring portion and the cut-raised portion are thus provided in a common portion, the blanking property is improved, and the load is prevented from

scattering, so that it is possible to obtain such effects that the spring constant can be reduced, and the strength of the cut-raised portion can be improved.

Further, lower guide projecting portions are formed at side edges of plate spring portions of a pad clip, respectively, so that projections can be rotated easily by making the lower guide projecting portions hook the projections when the friction pads are installed. Accordingly, the projections come into the clip smoothly so that the work of installation of the pads can be performed easily. In addition, upper guide projecting portions are provided also on the upper side portions so that the projections are guided by the upper and lower guide projecting portions. Accordingly, the work of installation of the pads can be performed more smoothly.

Claims

1. A pad clip for a disc brake, the disc brake comprising a friction pad disposed opposite to a rotor and a support member for bearing braking force from the friction pad, wherein one of a convexity and a concavity is formed at a side edge portion of the pad and the other is formed at a braking anchor portion of the support member, the convexity and the concavity engage with each other so as to form a concave and convex fitting portion, and the pad clip is disposed at the concave and convex fitting portion, which comprises:
 - an anchor portion disposed along an anchor surface formed at the concave and convex fitting portion;
 - an upper opposite portion connected to an upper end of said anchor portion and;
 - and a lower opposite portion connected to a lower end of said anchor portion;
 - wherein said anchor portion, said upper opposite portion and said lower opposite portion form a U-shaped side view tracing the concave and convex fitting portion, and one of said upper and lower opposite portions is formed as a plate spring portion which urges the friction pad in the radial direction of the rotor.
2. The pad clip according to claim 1, wherein said lower opposite portion is a plate spring portion.
3. The pad clip according to claim 2, further comprising a cut-raised portion being raised at a base end portion of said plate spring portion in the direction opposite to the radial direction and being brought into contact with a lower surface of the concavity.
4. The pad clip according claim 3, wherein an arc corner portion is formed between a support member anchor surface of the support member and the lower surface of the support member, and said cut-raised portion is bent to trace the arc corner portion and disposed along the arc corner portion.

5. The pad clip according to claim 3, wherein the start points of said cut plate spring portion and said cut-raised portion is common with the start point of the arc corner portion. 5
6. The pad clip according to claim 2, wherein said plate spring comprises:
 - an arc portion which is formed while bent so as to contact with the lower area of the anchor surface but not so as to contact with a lower surface of the concavity; 10
 - an extended portion formed by extending said arc portion in the obliquely upward direction; and
 - an upper contact portion formed in the top end of said extended portion so as to contact with a lower surface of the convexity. 15
7. The pad clip according to claim 2, further comprising upper and lower guide projecting portions respectively disposed at outside edges of said upper and lower opposite portions, said upper and lower guide projecting portions spread outward and upward. 20
8. The pad clip according to claim 7, wherein an upward extending angle of said upper guide projecting portion relative to the horizontal plane of said upper opposite portion is set to α and an upward extending angle of said lower guide projecting portion relative to the horizontal plane of said upper opposite portion is set to β , wherein the inequality $\alpha < \beta$ is satisfied, and said lower guide projecting portion projects outward more than said upper guide portion and the projecting distance in the horizontal direction is smaller than the thickness of the back plate of the friction pad. 25 30 35
9. The pad clip according to claim 2, further comprising support fitting pawls formed at both side edges of said anchor portion. 40
10. A pad clip for a disc brake comprising:
 - a bridge portion;
 - a pair of coupling portion connected to both ends of said bridge portion; and 45
 - a pair of U-shaped portions respectively connected to a lower end of said coupling portion; wherein the pad clip is made of one metal sheet and one of upper and lower portions of said U-shaped portion is a plate spring portion. 50
11. The pad clip according to claim 10, further comprising a cut-raised portion raised downwardly at a base end portion of said plate spring portion said cut-raised portion being formed by cutting and raising a corner portion of said U-shaped portion. 55
12. The pad clip according claim 11, wherein said cut-raised portion has a curved shape.
13. The pad clip according to claim 11, wherein said cut-raised portion is cut and raised in such a manner that the start point of said plate spring portion coincides with the notch start point of said cut-raised portion.
14. The pad clip according to claim 10, wherein said plate spring portion comprises an arc portion of which start point defines the start point of said plate spring portion and an extended portion formed by extending said arc portion in the obliquely upward direction.
15. The pad clip according to claim 10, further comprising upper and lower guide projecting portions respectively disposed at outside edges of the upper and lower portions of said U-shaped portion, said upper and lower guide projecting portions spread outward and upward.
16. The pad clip according to claim 15, wherein an upward extending angle of said upper guide projecting portion relative to the horizontal plane of said upper portion of U-shaped portion is set to α and an upward extending angle of said lower guide projecting portion relative to the horizontal plane of said upper portion of said U-shaped portion is set to β , wherein the inequality $\alpha < \beta$ is satisfied, and said lower guide projecting portion projects outward more than said upper guide portion and the projecting distance in the horizontal direction is smaller than the thickness of a back plate of a friction pad.

FIG. 1

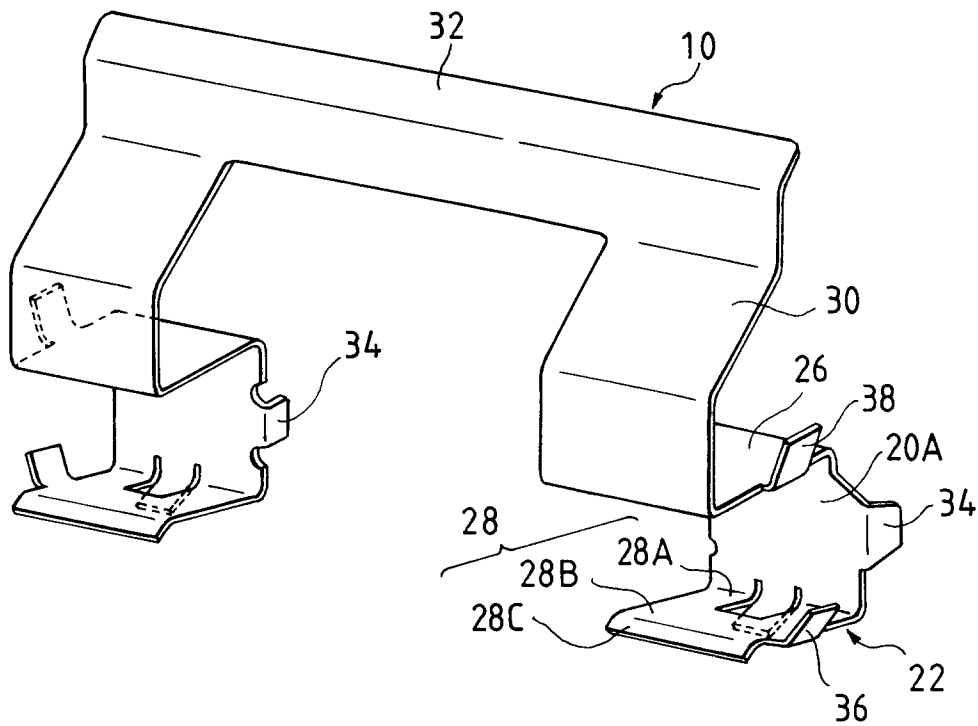


FIG. 4

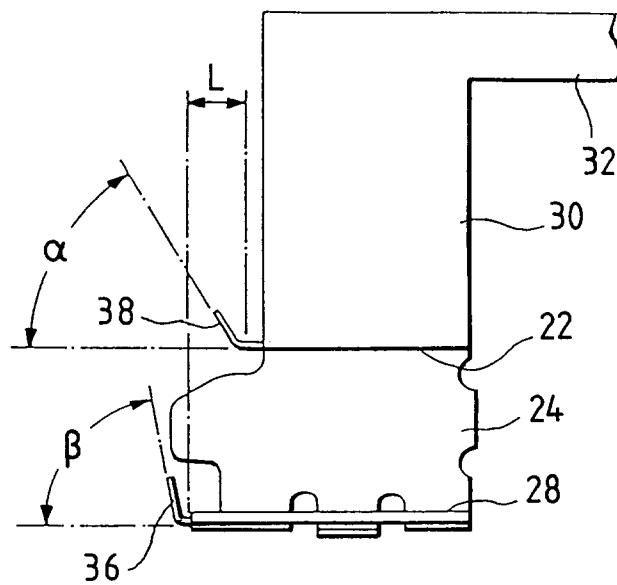


FIG. 2(a)

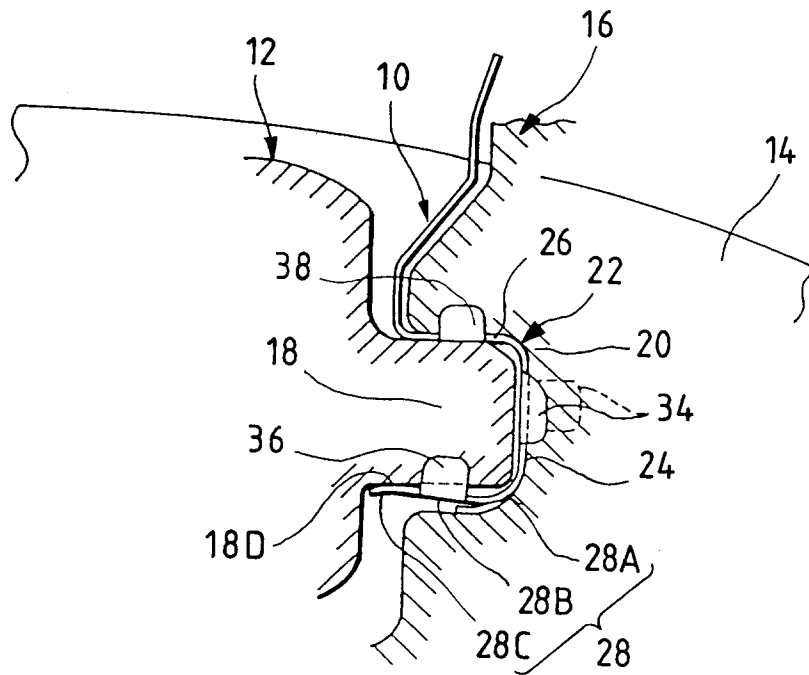


FIG. 2(b)

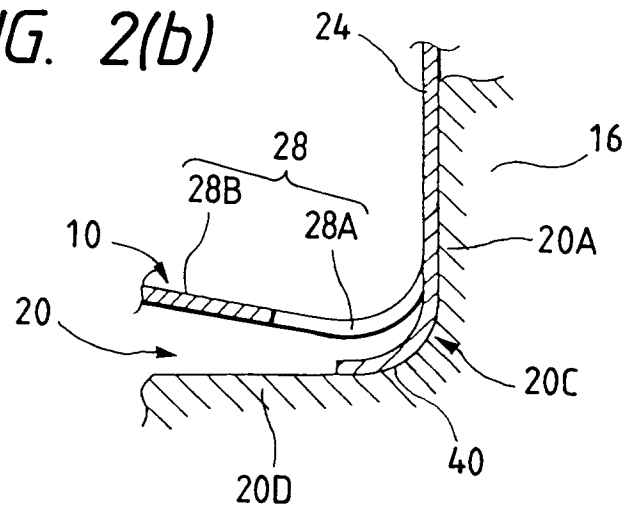


FIG. 3(a)

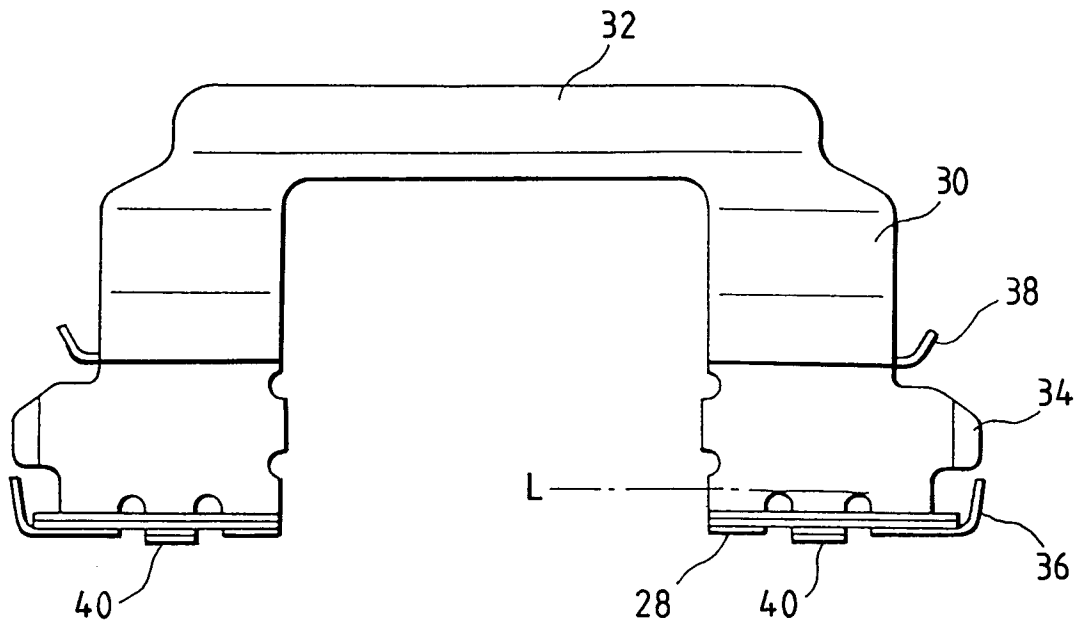


FIG. 3(b)

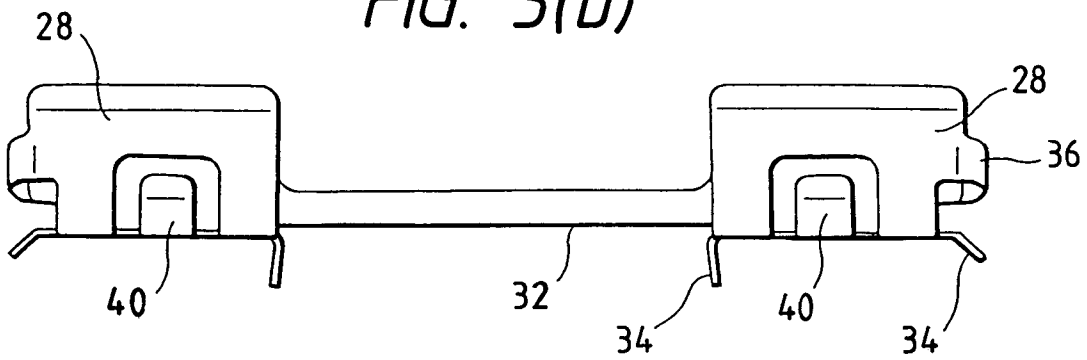


FIG. 5(a)

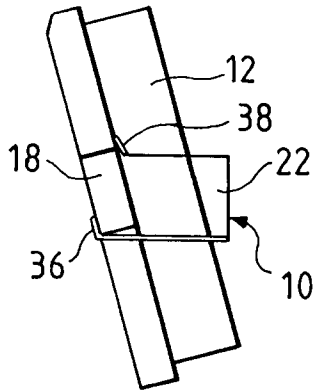


FIG. 5(b)

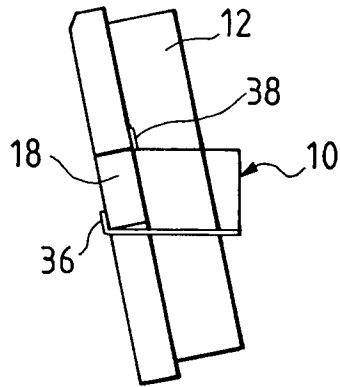


FIG. 5(c)

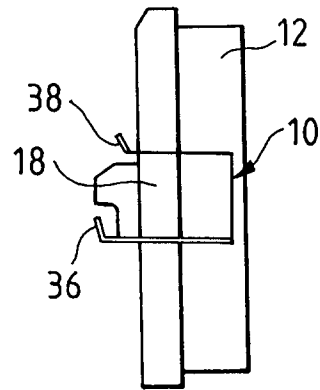


FIG. 6

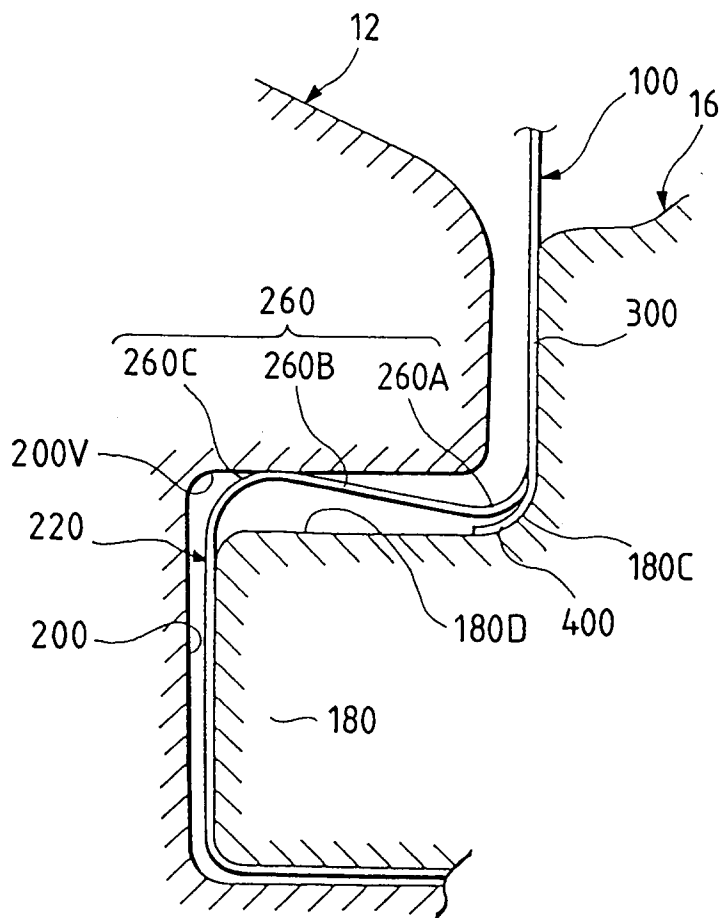


FIG. 7(a) PRIOR ART

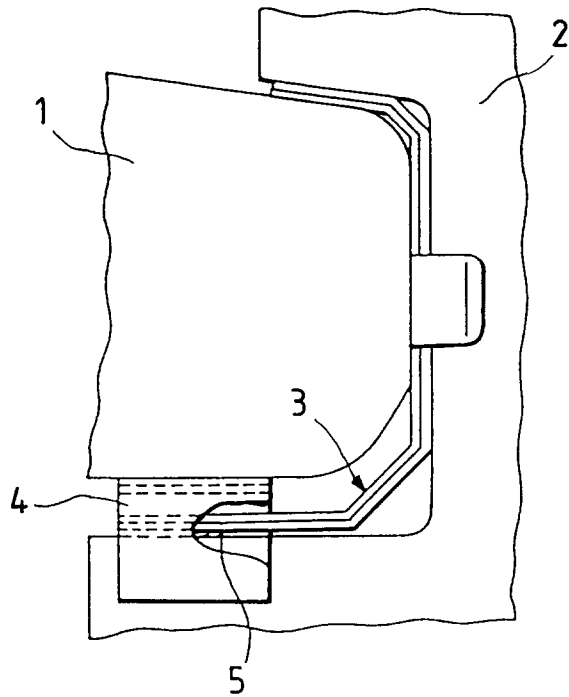
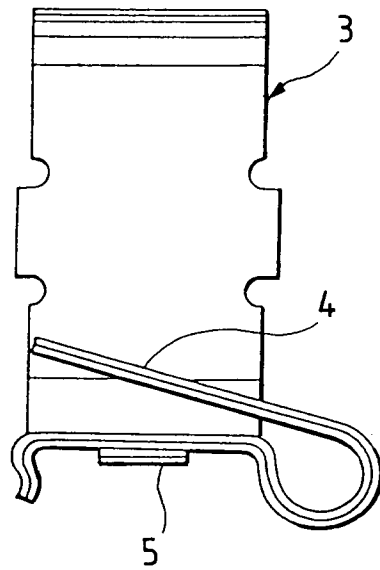


FIG. 7(b) PRIOR ART





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 10 4153

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	GB-A-2 172 068 (TOKICO) * page 3, line 14 - line 30; figure 5 * * page 2, line 69 - line 108; figures 1,2 *	10 1	F16D65/097
A	--- PATENT ABSTRACTS OF JAPAN vol. 18, no. 569 (M-1695) & JP-A-06 207631 (NISSHINBO) * abstract; figures 1,5 *	1,10	
A	--- US-A-4 429 769 (OSHIMA ET AL.) * column 2, line 23 - line 59; figures *	1,10	
A	--- US-A-4 371 060 (AKEBONO BRAKE INDUSTRY) * figures *	1	

			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F16D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 July 1996	Examiner Becker, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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